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TRICERCOMONAS INTESTINALIS AND ENTEROMONAS CAVIAE N. SP. AND THEIR GROWTH IN CULTURE

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Enteromonas hominis is the name given by da Fonseca (1915) to a new flagellate of the intestine of man, a very small organism possessing three anterior flagella, two of which are directed forward and one, somewhat longer, directed posteriorly but not adherent to the surface of the body. Wenyon and O'Connor (1917; 1919) described a somewhat similar small flagellate; however, it has four anterior flagella, three directed forward and one recurrent, attached to the body surface for a part of its length. The cysts of Tricercomonas were also described but da Fonseca reported no cyst for his organism.

Dobell (1921) considers that these two flagellates are probably the same and accepts Wenyon and O'Connor's description, their name, however, giving way to *Enteromonas hominis* da Fonseca. He tentatively identifies with this species also *Trichomastix hominis* Chatterjee (1917), *Diplocercomonas soudanensis* Chalmers and Pekkola (1919), and *Enteromonas bengalensis* Chatterjee (1919), all of which bear slight variations in their descriptions.

Recently the writer has had occasion to observe a small flagellate which is apparently identical with *Tricercomonas intestinalis* Wenyon and O'Connor and to make some comparisons between it and a flagellate from the guinea-pig which resembles closely *Enteromonas hominis.*

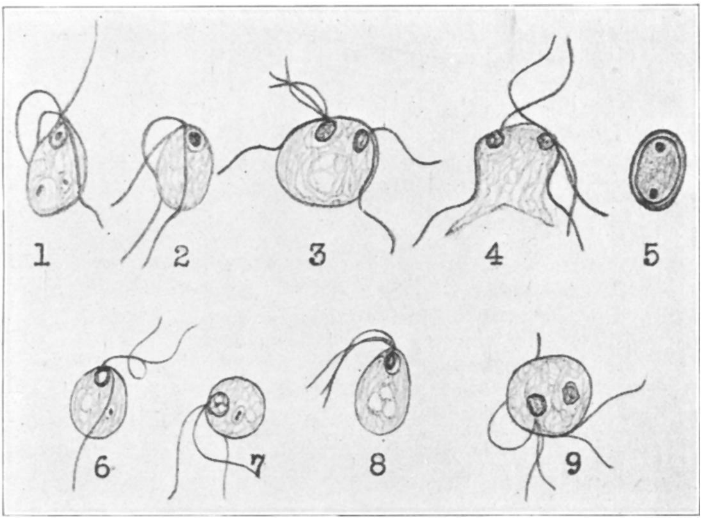
The human flagellate comes from the stools of a woman, in which it is associated with Chilomastix, the host showing no intestinal symptoms referable to the presence of the organism. The flagellate was not seen in the material from a duodenal drainage and consequently is to be considered a lower intestine inhabitant. It probably occurs in the large intestine as was the case of the flagellate from the guinea-pig. It occurred in considerable numbers in the fresh stool from which it disappeared within 24 hours.

It varied in size from about 4 to 7 or 8 microns in its longest diameter, it being almost rounded or slightly ovoid. It is very active in fresh preparation, swimming jerkily and rotating at the same time. The body is alveolated and vacuolated and contains bacteria. It anchors itself by a caudal process as is the habit of other flagellates when feeding. The anteriorly directed flagella move rapidly and are not to be counted with certainty in an active stage. At times they can be seen to come from a minute knob, apparently the blepharoplast. There is a recurrent flagellum which arises at the same place, passing posteriorly over the surface of the body to which it is adherent for about three-fourths of the body length, terminating in a free extremity from the posterior quarter. In motion there is a slight protoplasmic projection where this flagellum leaves the body. The nucleus is not visible in the unstained. Only a few cysts similar to those described by Wenyon and O'Connor have been observed. These were ovoid, slightly smaller than the active organism, having a definite cyst wall enclosing the organism which contained a nucleus at each end in the stained specimens. Further development of the cyst has not been seen in this case. Proper observation of the flagella has been difficult in direct preparations even when stained. In thin films made from cultures they have been stained with Wright's blood stain. There are three of about equal length directed forward, the one recurrent being slightly longer. The nucleus may be properly observed in direct preparations as well as in specimens from culture stained by the iron-haematoxylon method. It is ovoid and situated near the origin of the flagella. Usually it shows a distinct karyosome but in the dividing the chromatin is loosely distributed through the nucleus.

The organism grew well in ascitic fluid diluted with 4 parts of 0.9 per cent. sodium chloride solution at 37 C. for four days but transplants were not successful. It lived in diluted blood serum for a few days but apparently did not multiply. In the ascitic fluid the size ranged from about 3μ in the young to about 10μ in the large dividing forms. Activity was about the same as in the fresh stool and the number increased very materially during the second 24 hours. No encystment was observed. Division, although difficult to follow and not completely observed, is apparently by longitudinal splitting. The chromatin becomes distributed through the nucleus and it divides into two before the splitting of the body commences. Whether the nuclear division is mitotic has not been made out. The two halves are equipped with flagella before the body division occurs. Whether there is a full quota of 3 anteriorly directed flagella on each at first is uncertain, but at least 1 of the 2 has 3 and the recurrent fully developed before body division is completed. The other has the recurrent flagellum but only 1 anteriorly directed has been observed. Multiple division may occur as some forms with 4 nuclei were seen. The small size of the organism makes it very difficult to follow accurately the nuclear changes and the process of division.

Enteromonas of the Guinea-Pig

A flagellate somewhat similar to the above and closely resembling da Fonseca's *Enteromonas hominis* has been encountered in the guinea-pig. The size, motion, shape, nucleus, cultural qualities, and general appearance of the organism correspond to those given above for the Tricercomonas. However, there appear to be only two anteriorly directed flagella and the recurrent one does not appear to be adherent to the body, at least it is not always so. It often lies back over the body but frequently is distinctly unattached and sometimes occurs in a group with the other two. Multiplication takes place in culture similarly to the case of the Tricercomonas. Encystment has not been recognized. This flagellate appears to be at least closely related to da Fonseca's organism and it is proposed to call it *Enteromonas caviae* n. sp.



Figs. 1-5.—*Tricercomonas intestinalis.* Figs. 1 and 2 composite drawings of specimens from culture, Wright's stain used for the flagella and iron-hematoxylin for the nucleus. Figs. 3 and 4 dividing forms from culture, Wright's stain. Fig. 5, cyst.

Figs. 6-9.—*Enteromonas caviae* n. sp. Composite drawings as above.

Discussion

From the above observations it seems at least doubtful that *Enteromonas hominis* and *Tricercomonas intestinalis* are the same. The observations of *Tricercomonas intestinalis* by Wenyon and O'Connor are substantially confirmed in the case of the human flagellate and its geographic distribution is widened. The occurrence of the similar flagellate in the guinea-pig does not, of course, prove that the observations reported by da Fonseca on his flagellate in man are correct, but the observations here recorded indicate that there is such an organism as he describes and lends support to the indication that Enteromonas and Tricercomonas are distinct. At any rate the evidence is considered sufficient to allow *Tricercomonas intestinalis* to be retained for the present as the intestinal flagellate described by Wenyon and O'Connor.

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